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Phaeodactylum tricornutum

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Diatoms, key photosynthetic micro-eukaryotes, found in all aquatic ecosystems are classified based on their symmetry into pennates (elongated) and centrics (radial symmetry). *Phaeodactylum tricornutum* is a marine pennate species that has become an experimental model used to understand diatom biology. The nuclear genome is chimeric, containing genes derived from ancestral endosymbioses with red and green algae, and enriched by genes acquired laterally from bacteria. Novel combinations of genes enable novel metabolisms, e.g., related to cell wall biogenesis. Together with the genome from the centric *Thalassiosira pseudonana* (the first to be sequenced) and multiple transcriptomes from other diatoms, it provides the basis for comparative genomics studies and for interpreting the ecological success of diatoms. These studies have revealed little synteny and no major segmental duplications between centric and pennate diatoms, and transposable element mobilization may underlie diatom genome diversification.

Taxonomy and Classifications

Kingdom: Chromalveolata or CASH lineage eukaryotes (cryptophytes, alveolates, stramenopiles, and haptophytes)

Superphylum: Heterokonta or Stramenopile

Phylum: Bacillariophyta

Class: Bacillariophyceae

Order: Naviculales

Family: Phaeodactylaceae

Genus: *Phaeodactylum*

Species: *tricornutum*

Genome Facts:

- Genome size 27.4 Mb (between 20 and 33 chromosomes)
- 12,233 coding genes
- ~12.3% repetitive sequences, mainly *copia* retroelements (~62%); including diatom-specific classes (CoDi elements)
- ~5.2% cytosine methylation, principally in CpG context
- Diatom genomes are evolving fast (5x faster than metazoans), especially diatom-specific genes.

- Genome and epigenome browser:
http://protists.ensembl.org/Phaeodactylum_tricornutum/Info/Index

Species Facts:

- First described by Bohlin in 1897. Formerly known as *Nitzschia closterium*. The clone of *P. tricornutum* that was sequenced is CCAP1055/1 and is available from CCAP.
- Model organism for diatoms, due to ease of lab growth and genetic transformation.
- Can be transformed by biolistics, electroporation, conjugation. Nuclear and chloroplast transformation is possible.
- Can exist in different morphotypes (fusiform, triradiate, oval, cruciform, round); Changes in cell shape can be stimulated by environmental conditions.
- Ten ecotypes from around the world have been characterized.
- To date no substantial evidence for sexual reproduction.
- Has been particularly useful to reveal insights into diatom C, N and Fe metabolism, as well as cell cycle. Utilizes Si facultatively.
- Widely cultivated as food for larval molluscs and fish in aquaculture.
- Considerable interest in using it for biofuels and high value pharmaceuticals.

Fun Fact About the Genome

Genome contains extraordinarily high numbers of genes encoding cyclins and heat shock transcription factors.

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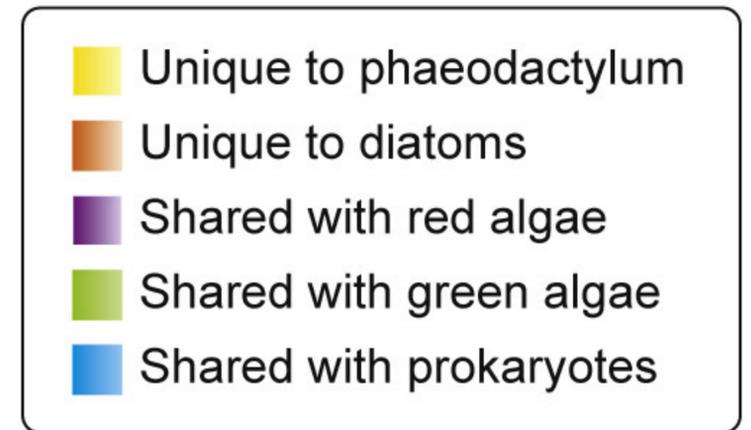
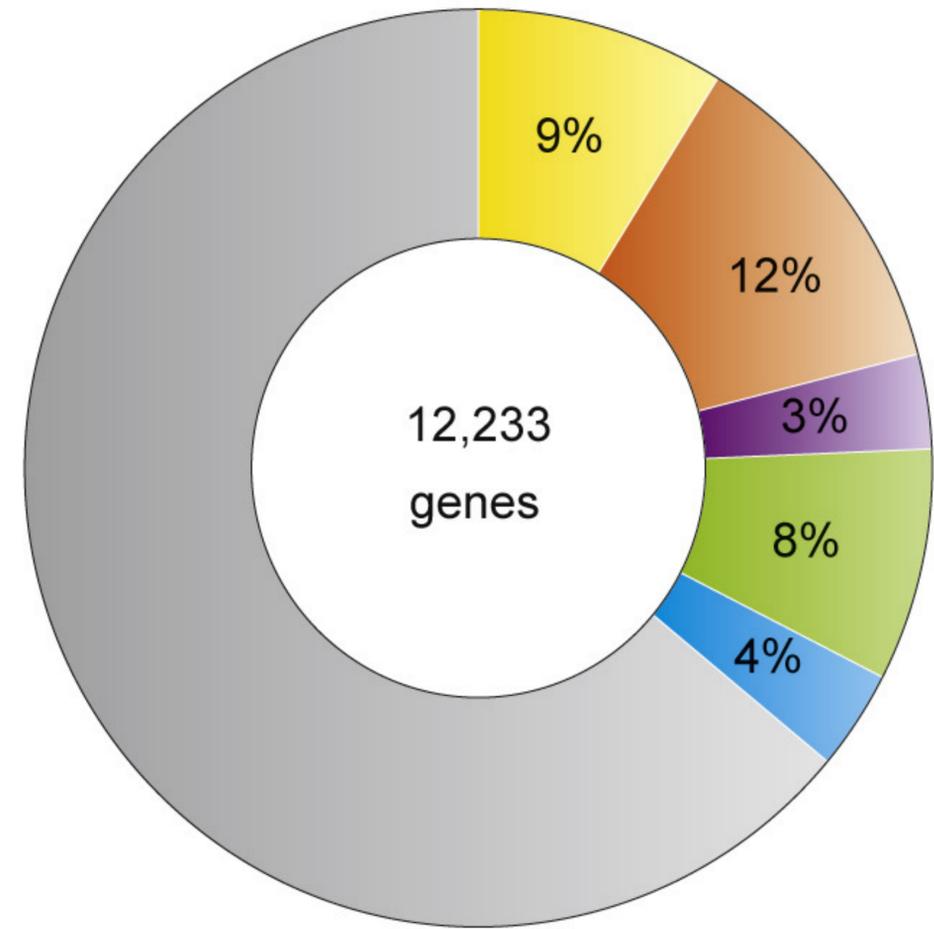
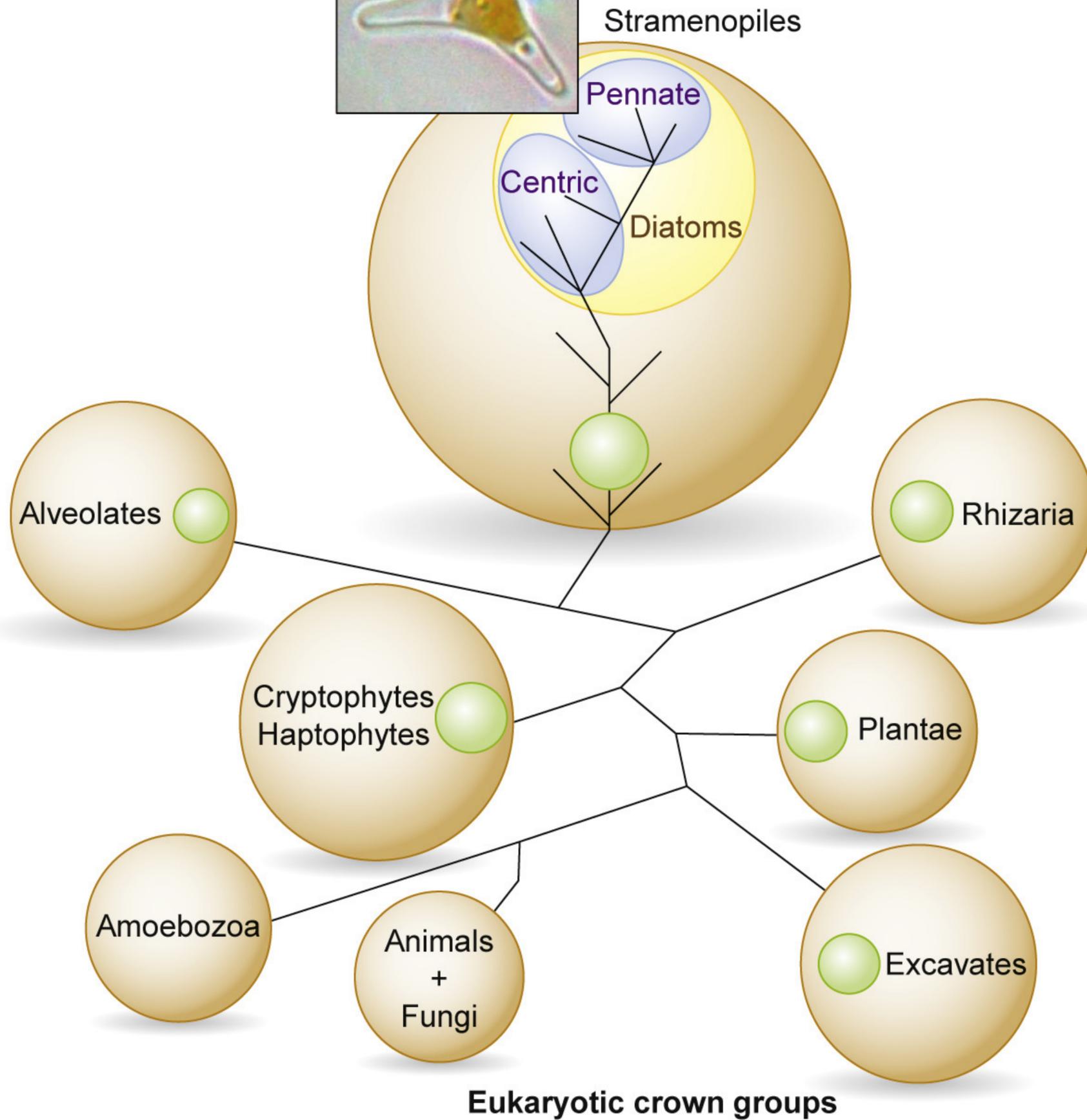
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 Group contains photosynthetic representatives

